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(54) Apparatus for generating musical scale sound by footsteps thereon

(57) Musical scale sounds are generated when any of foot-switches in a ring-shaped flexible sheet (2) are depressed. In the flexible sheet (2), a perforated (4) cushion member (3) of insulating material is inserted between plural pairs of thin electrodes (1) to form the foot-switches. An external circuit including an oscillator (8), an amplifier (9) and a speaker (10) is connected to the flexible sheet (2) by a cable (11) to generate the musical sound in response to the contact of any of the pairs of the electrodes (1).

FIG. 3

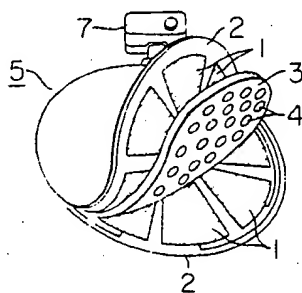
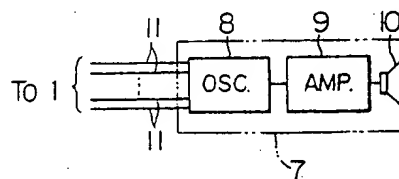


FIG. 4



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FIG. 1

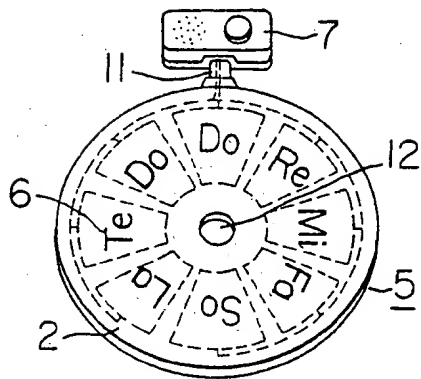


FIG. 2

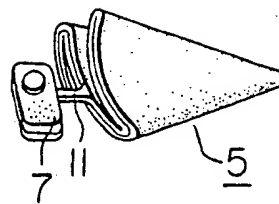


FIG. 3

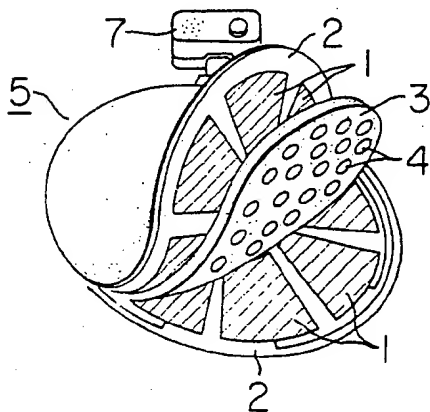


FIG. 4

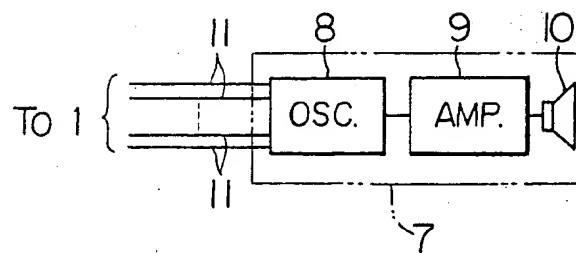


FIG. 5



SPECIFICATION

Apparatus for generating musical scale sound by footsteps thereon

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DESCRIPTION

This invention relates to an apparatus which generates musical sound from a speaker when children step on a footboard, and with which they can take natural exercise rhythmically and master one of the bases of music, such as rhythm. The present invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings; in which:

10 *Figure 1* is an explanatory view of an apparatus for generating scale sounds according to this invention; *Figure 2* is a perspective view showing the state in which the footboard of the above apparatus is folded;

20 *Figure 3* is a perspective view of the apparatus in which a part of the footboard is disassembled; *Figure 4* is a diagram of the electric circuit system; *Figure 5* is an explanatory view showing a state where the apparatus is being used;

25 *Figure 6* and *Figure 7* are explanatory views showing other embodiments of the apparatus;

Figure 8 is an explanatory view of a prior art treadle type scale generating apparatus; and

30 *Figure 9* is an enlarged cross-sectional view along the line IX-IX of *Figure 8*.

An apparatus for generating musical scale sound by stepping up and down a staircase has been currently known. However, such an apparatus has been dangerous for children because the staircase has been used as a footboard. As each step is so arranged to have a different scale note, it happens that plural steps should be skipped over to obtain a desired musical sound. This has made it difficult to obtain a sense of rhythm. Another prior art treadle type scale play equipment is as shown in *Figures 8* and *9*, in which a plurality of footboards with different scales are provided in a planar form to facilitate a jump and also transfer and keeping of the apparatus.

45 In those figures, 13 denotes a mat capable of being flexed, 14 is a conductive electrode provided by cutting out a part of the mat 13 in a circular form, and 15 is a footboard of insulating material on the inner side of which a conductive plate 16 is mounted. A cushion 17 of elastic gum sponge is adhered to the conductive plate 16, which is mounted over the conductive electrode 14 demountably. Namely, when the footboard 15 is stepped on, the conductive electrode 14 is short-circuited by the conductive plate 16 and a signal is transmitted to the musical sound generating apparatus 19 through a cable 18 to generate musical sound corresponding to the footboard 15. When the footboard 15 is not contacted with a foot, the conductive plate 16 is separated from the conductive electrode 14 to open the circuit and stop the generation of the sound. Transfer and storage of the apparatus are done by removing each footboard 15 and folding up the mat 13.

As described above, since the footboards 15 are made of a metal conductive plate 16 incapable of

being flexed, there is a problem that in time of storage they should be demounted one by one.

There is a fear that some of the footboards 15 can be lost. A further defect is that since the footboards are projecting on the mat 13, they can easily tip a user. When the apparatus is used outdoors, rainwater can enter the mat 13 and short-circuit the electrode part 14. So, when the mat 13 becomes dirty, it can not be washed. Even when the apparatus is used indoors, the same dangers as described above can happen if a drink such as juice spills over the mat 13. Since the apparatus is often used with the bare feet, a hard footboard gives a bad sense of touch and a large shock in time of skipping or falling. Therefore, this invention aims to remove the above-described defects in the prior art apparatus.

According to this invention, a switch means with cushion material is sealed in a synthetic resin sheet capable of being flexed, said switch means has such a structure that electrodes formed by thin electrically conductive material of aluminium foil, etc. are made contact with each other to form an electric circuit when they are pressed while separating from each other when the pressure is removed. The above flexible sheet itself forms a footboard to avoid any necessity of providing a separate footboard, inconvenience in disassembly at the time of storage, or fear of loss. Since the switch means is sealed in a synthetic resin sheet, danger of the ingress of rainwater or drink such as juice into the switch means is removed. When the sheet becomes dirty, it can be washed in water. Further, the sheet can be turned the other way for use. Since no hard footboard is used, a hard shock at the time of jumping or falling can be mitigated. The defects in the prior art are also removed by using a footboard with a good sense of touch.

One embodiment of this invention will be explained hereinafter with reference to the accompanying drawings.

In *Figures 1 - 5*, reference numeral 1 denotes a nearly fan shaped electrode formed by a thin conductive material such as aluminium foil, etc. Each electrode 1 is bonded by synthetic resin, etc. to the inner surface of a flexible sheet 2 formed like a doughnut in such a manner that the electrodes 1 are held separately spaced radially. Numeral 3 denotes a cushion with a doughnut shape in which a number of through holes 4 are perforated. The cushion 3 is inserted between a pair of sheets 2. When one of the sheets 2 is stepped on, a pair of electrodes 1 are made contact with each other through the holes 4 in the cushion 3 to form a circuit. When the sheet 2 is not stepped on, the electrodes are separated from each other due to the elasticity of the cushion such that the electrodes act as a switch. The pair of sheets 2 are bonded to each other to seal the electrodes 1 therein and form a skip board 5. Numeral 6 denotes scale marks or indicia printed on the positions of sheet 2 corresponding to the electrodes 1 sealed in the sheet 2. Numeral 7 denotes a musical scale generator incorporating scale generating means such as an oscillator means 8, an amplifier 9 and a speaker, etc., as shown in *Figure 4*. The oscillator means 8 is connected to each electrode plate 1 by a

FIG. 6

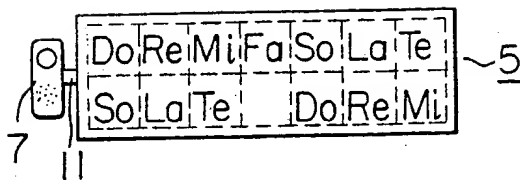


FIG. 7

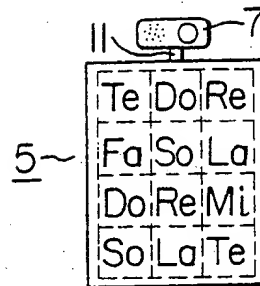


FIG. 8

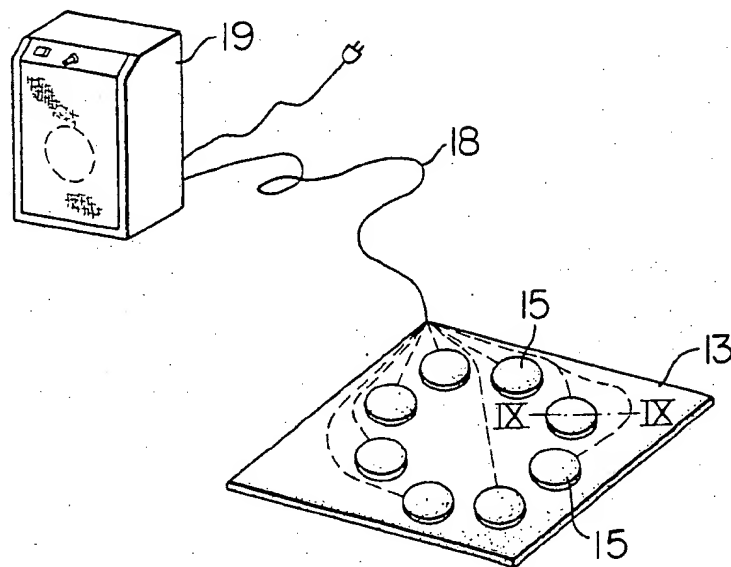
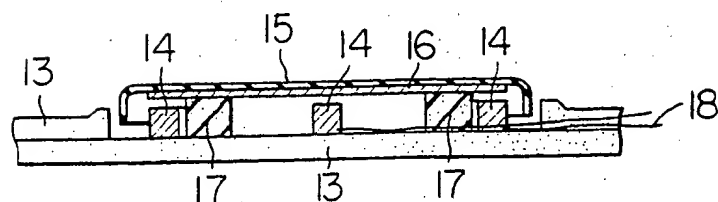


FIG. 9



multi-core cable 11.

In the arrangement as described above, when a desired scale mark 6 on the sheet 2 of the skip board 5 is stepped on, the cushion material 3 provided in the skip board 5 is compressed and the electrode plate 1 formed by a thin plate distorts. A pair of electrodes 1 positioned on the upper and lower surfaces of the cushion 3 contact each other to form a circuit. Then, the oscillator means 8 operates, and the amplifier 9 amplifies the oscillation signal. As a result, the speaker 10 generates a musical note. Therefore, if one changes step from one scale mark to another one, musical notes corresponding to separate scale notes are generated from the speaker 10, and thereby the user can master a sense of rhythm. The user can take exercise by skipping and generating various types of musical sound.

Storage of the apparatus is facilitated by folding it up as shown in Figure 2, because the skip board 5 itself is formed flexibly. Furthermore, since the skip board 5 is formed in the shape of a doughnut with a hole 12 in the central part, folding-up is done easily without causing any creases.

Figures 6 and 7 show other embodiments of this invention, where the shape is rectangular but the internal structure is the same as mentioned above. Although the electrode plates are formed by adhering thin conductive material such as aluminium foil to the sheet, other conductive material such as carbon may also be used.

This invention has the following structure. Electrode plates formed by thin conductive material such as aluminium foil are provided on the inner surfaces of a flexible sheet of synthetic resin separately. The flexible sheet is so adjusted that the electrode plates are opposed to each other through a cushion member having through holes. The electrode plates are tightly sealed in the sheet, on which scale tone marks are disposed corresponding to the electrode plates in the sheet, thereby to form a skip board. Each electrode in the skip board is connected to the musical sound generating means through a multi-core cable, whereby a skip scale generating apparatus is constituted. When a scale mark part is stepped on, the inside cushion material is compressed and electrodes corresponding to the stepped scale contact with each other. An electric circuit is formed and a musical note is generated from the speaker of the musical sound generating means. While when the scale mark part is not stepped on, contact between the electrodes is cut off due to the electricity of the cushion material. Since the switch part is tightly sealed in the flexible sheet, no provision of a footboard to open and close the switch is necessary. The skip board itself has a function of a footboard. Since no footboard projects on the skipboard, there is no fear of stumbling while skipping. Even if rainwater or drink such as juice is spilt over the skip board, it does not penetrate into the inner part so that short-circuiting of the switching formed by the electrodes and leakage of electricity are avoided, which promotes safety. Even if the top surface of the skip board is stepped on by shoed feet and becomes dirty, it can be washed with water and cleaned. The apparatus is useful because it may

be used in an inverted state. Also the structure that the electrodes constituting the switch part are formed by thin conductive material such as aluminium foil and covered with a flexible sheet and that the sheet is directly stepped on, gives a good sense of touch while playing. This removes any large shock as encountered in the case of a hard footboard. The shock which one experiences when one falls down on the skip board is mitigated so that no injury is inflicted. The capability of being folded without disassembling the footboard saves trouble in time of storage. Fear of losing some of the footboards is avoided. Therefore, the apparatus of this invention has a large practical effect.

CLAIMS

1. An apparatus for generating musical scale sounds by footsteps thereon comprising:-
 - plural pairs of thin electrodes for switches;
 - a cushion member inserted and fixed between said pairs of electrodes, said cushion member being formed to enable both electrodes of one of said electrode pairs to contact each other;
 - two sheets of insulating material having flexibility, said sheets superposed on each other to seal therein said plural pairs of electrodes with a distance between said both electrodes of each pair maintained at a constant value; and
 - lead wires for connecting said each electrode pair and a musical sound generating means;
 - wherein on at least one surface of said sheets, indicia such as musical scale marks, etc. are provided corresponding to musical sound generated by said musical sound generating means through contact between said both electrodes of each electrode pair.
2. An apparatus according to claim 1, wherein said sheets are formed in a doughnut-shape.
3. Apparatus for generating musical scale sounds by footsteps and substantially as hereinbefore described and as shown in Figures 1 to 5 or Figure 6 or Figure 7 of the accompanying drawings.

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